

PCT

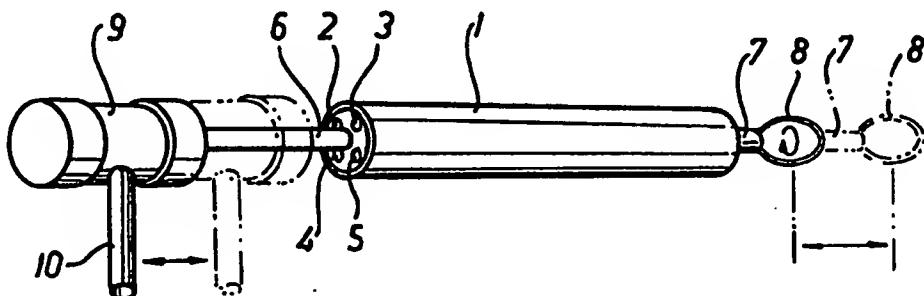
WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ :	A1	(11) International Publication Number: WO 95/30377 (43) International Publication Date: 16 November 1995 (16.11.95)
A61B 17/32, 17/38, 17/39		
(21) International Application Number:	PCT/SE94/00413	(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).
(22) International Filing Date:	6 May 1994 (06.05.94)	
(71)(72) Applicant and Inventor:	DAHLSTRAND, Christer [SE/SE]; Storängsgatan 22, S-413 19 Göteborg (SE).	
(74) Agent:	AWAPATENT AB; P.O. Box 11394, S-404 28 Göteborg (SE).	Published <i>With international search report. In English translation (filed in Swedish).</i>

(54) Title: A SURGICAL INSTRUMENT, PARTICULARLY FOR OPERATIVE TREATMENT OF THE PROSTATE GLAND



(57) Abstract

A surgical instrument for the treatment of in first hand the prostate gland. The instrument comprises mainly a tube (1) having channels (2, 3, 4, 5) for inspection, illumination, inflow of flushing liquid and for the removal of liquid and cut away tissue. The tube (1) contains a shaft (6) driven by a motor (9), said shaft, at its end to be inserted to the prostate gland, carrying a knife (8). The motor (9) is rotating the shaft (6) and causes the knife (8) to perform a rotating movement for the operative treatment of the prostate gland. The knife and the shaft may also be displaced relatively to the tube.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

A SURGICAL INSTRUMENT, PARTICULARLY FOR OPERATIVE
TREATMENT OF THE PROSTATE GLAND

5 The present invention relates to a device for motorised endoscopical removal of tissue in a living body, particularly for operative treatment of the prostate gland, said device comprising a tube-shaped body having a handle, channels for inspection, illumination, influx of 10 flushing liquid as well as removal of liquid and cut tissue and the like. Growth of the prostate gland happens to many human beings of the male sex, viz. 50% of all men in their sixties and 80% of the men in their eighties. When the prostate gland grows, the urethra is compressed 15 and the discharge of the urine is rendered difficult and eventually completely impossible by complete clogging of the urethra. The growth varies in a very high degree, e.g. from some few grams to several hundred grams. For many decades of years these problems have been rectified by 20 means of surgery and one has then used a U-shaped knife to scrape off or cut away tissue. The knife is attached to a tube-shaped implement having an inspection channel and a flushing channel. The knife is preferably conducting electricity so as to burn blood vessels in order to 25 diminish the bleeding. This surgery has been carried out manually and is a technically very advanced operation requesting a delicate touch. A well trained surgeon could manage to remove a certain number of grams per time unit, thus a well trained and skilled operator could manage to 30 remove about 1 gram per minute. An operation should for many reasons have a duration of no more than one hour, i.e. because the complications, that may occur, such as bleeding and resorption of flushing liquid, are related to the time of the operation and further the anaesthesia has 35 a limited duration.

The aim of the present invention is to overcome the problems explained supra and to achieve this the invention is characterized by a shaft extending through the instrument body, said shaft rotated by a motor arranged at 5 one end of the shaft such that a knife arranged at the opposite end of the shaft adapted to be moved axially in relation to the body, is brought to rotate for carrying out the surgical treatment.

Thereby high precision can be ensured in spite of a 10 considerable increase of the speed at the carrying out of the operation in comparison with previously known technique. Further, the invention makes it possible to operate on very big prostate glands using endoscopic surgery which previously was not possible.

15 According to a further feature of the invention the shaft is electrically isolated from the instrument body, such that electric current may pass through the shaft to the knife so as to facilitate the cutting and stop the bleeding. It is preferable to include a safety switch so 20 as to prevent too deep a cutting. The body is certainly provided with an evacuation channel for the removal of liquid and cut tissue but it might nevertheless be of advantage to provide another channel for the same purpose preferably in addition to the channel in the instrument 25 body. The flushing liquid may be injected continuously why the quantity of such liquid could be rather important and furthermore urine may be added to the bladder and has to be removed.

At the operation there is a risk of bleeding which 30 causes a red colouring of the drainage liquid. This may be used as a warning and via an electronic circuit be used to stop the motor.

The invention will now be described more in detail with reference had to the accompanying drawings. In the 35 drawings:

FIG 1 is a perspective view of the device according to the invention;

FIG 2 is an end view of the body of the instrument with a knife and a safety switch;

5 FIG 3 is a broken side elevation of the same part of the instrument;

FIG 4 shows the instrument body with the motor arranged inside the same;

FIG 5 shows the connection of the motor to the shaft 10 in the body by means of a flexible shaft;

FIGS 6 and 7 are views in different directions of a more detailed embodiment of the instrument according to the invention; and

FIG 8 shows a further embodiment of the invention.

15 The instrument shown in Fig 1 and intended for surgical treatment in the first place of the prostate gland comprises a body 1 having four channels 2, 3, 4 and 5 for inspection, illumination, inflow of flushing liquid and for removal of liquid and cut tissue. Extending 20 through the body 1 is a shaft 6 carrying on its end 7 extending out from the end of the instrument body 1 and according to the embodiment shown in Fig. 1 a cutting tool in i.e. a knife in the shape of a loop 8. At its other end the shaft 6 carries, according to the embodiment shown in 25 Fig. 1, a motor 9 having on its mantle a handle 10 attached thereto. This operation tool functions such that when the body 1 has been inserted through the urethra to such an extent that the knife 8 is situated at the prostate gland, the motor 9 is started. The shaft 6 is 30 then brought to rotate and makes the knife 8 to rotate so as to cut a layer of the prostate gland. By means of the handle 10 the motor 9 with the shaft 6 and the knife 8 can be shifted as indicated whereby tissue is removed along the whole of the prostate gland. This sliding movement in 35 the sleeve-shaped body means that fretting of the sleeve against sensitive tissue is avoided. The cutting operation can during the whole process be watched through the

- inspection channel 2 and flushing can be performed through the channels 4 and 5. Electrical current can easily be led through the knife and thereby bleeding can be stopped by burning of blood vessels. This surgical instrument thus
- 5 makes it possible to carry out the operation in a very short time which means not only an increased efficiency and improved productivity of the surgeon but also less strain on the patient which must be considered as being of a very special importance.
- 10 In Figs. 2 and 3 there is shown the end portion of the instrument body 1 with the knife 8. In these Figs. there is shown how too deep a cutting may be prevented by the arrangement of a safety switch 11 which is detecting if the knife 8 should sink to an unpermissible depth. In
- 15 such a case the end of the instrument body 1 will be lowered such that the loop 11, i.e. the safety switch is swung about its fulcrum 12 to influence a contact means 13 so as to cut the current to the motor 9 and thus interrupt the cutting of the prostate gland.
- 20 In Fig. 4, the motor 9 is shown arranged interiorly of the instrument body 1 and in Fig. 5 there is shown how the motor 9 may be arranged outside the instrument body 1 and connected to the shaft 6 by means of a flexible shaft 14.
- 25 The previous Figs. 1 - 5 have had for their purpose to show the invention principally. In Figs. 6, 7 and 8 there is shown a concrete embodiment of the instrument according to the invention. This instrument shows at its upper - according to the drawing - and an inspection glass
- 30 15 and a connection 16 to a source of light (not shown).

The inspection glass 15 further carries a thumb grip 17 and as a counterstay the instrument has been provided with a finger grip 36 such that the surgeon with one hand may bring the instrument into the position where the knife

35 is ready for cutting while holding the instrument steadily. A motor, not shown, is coupled to the flexible shaft 18 which via a gear 19 transmit a rotating movement

to the shaft 20 and thus to the knife 8 as well so as to carry out the operative treatment of the prostate gland. The instrument further has a connection 21 for flushing liquid for the removal of cut tissue and of urine.

5 Fig. 8 shows a further embodiment of the operation instrument according to the invention. Also in this case the instrument is provided with an inspection glass 15 with a connection 16 to a source of light, not shown. The inspection glass 15 is in this embodiment attached to the
10 instrument by means of a bayonet clutch 22. As is the case in previously described embodiments also in this case there has been arranged a connection 16 to a source of light.

The instrument has a central body 22, a gear 23 being
15 arranged in said central body 22. This gear 23 is driven by a motor 24 which in turn is manoeuvered by means of a pedal 25 having an electrical connection plug 26. The motor 24 can be connected to the gear 23 by means of a bayonet clutch 27. The gear 23 drives a shaft 29 arranged
20 in a mantle or guiding tube 28, said shaft 29 carrying at its outer end the operation knife 8. The shaft 29 comprises a tube and is housing an optical tube 30 which at its - in a way of speaking - end is provided with an optical device 31 which makes it possible for the surgeon
25 to watch the activity of the knife 8. The guiding tube 28 also has a connection 31 for the inflow of flushing liquid and one connection 32 for the removal of the flushing liquid. Between the different tubes in the guiding tube 28 interspaces are formed which can be used for conducting
30 flushing liquid to the operation area and be removed together with urine and cut away tissue. The guiding tube 28 can as shown be connected in a proper manner by means of a bayonet clutch 33 and a liquid seal 34 ensures then that flushing liquid is prevented from leaking out at the
35 inner end of the guiding tube 18. This embodiment of the instrument according to the invention has a cable 35 for the feeding of electricity serving to increase the cutting ability of the knife 8 and to stop the bleeding.

6

- The invention is not restricted to the shown and described embodiments but many modifications are possible within the scope of the appended claims. Thus, the intercoupling of the parts of the instrument may be
- 5 carried out in another way than shown by means of bayonet clutches. Neither are the arrangements of the connections for the inflow of light and flushing liquid in any way restricted to the shown embodiments. Also other details may be modified in an effort to adopt them to different needs
- 10 as the essential idea of the invention is to provide an instrument which thanks to its very special construction makes it possible to carry out the surgical treatment of the prostate gland in a considerably shorter time and by means of a less tiring work than has previously been
- 15 possible for a surgeon. Further the treatment is safer as regards the patient. It is also possible to operate on a bigger prostate gland than what has been possible by means of endoscopic surgery. The knife may have another form than the one shown in the drawings and described supra.
- 20 For instance, the knife may be composed of blades extending from the shaft. It can also be replaceable. However, it is important that the surgeon can look through the rotating knife. It may also be of importance to adapt the rotation speed of the knife to the frequency
- 25 of the light.
- Instead of being rotated continuously in one direction the knife may be rotated alternately in both directions parts of one rotation or several rotations in either direction.
- 30 The endoscopic channel and other tubes may be completed or be replaced by means of video techniques.

CLAIMS

1. A device for motorized, endoscopic removal of
5 tissue from a living body, in particular for operative
treatment of the prostate gland, said device having a
tube-shaped body which is provided with a handle, channels
for inspection, illumination, introduction of flushing
liquid and for the removal of liquid and cut tissue,
10 characterized by a shaft extending through
said instrument body and adapted to be rotatively driven
as well as for performing an oscillary movement, by a
motor at one end of said shaft such that a knife at the
other end of the shaft is given a rotating movement for
15 performing the operative treatment, said knife being
axially displaceable by means of said handle.

2. A device as claimed in claim 1, characterized
by the fact that the shaft is electrically
isolated from the instrument body such that electrical
20 current may be passed through the shaft to the knife so as
to facilitate the cutting and stop bleeding.

3. A device as claimed in claim 1 or 2, characterized
by a safety switch which is preventing
too deep a cutting (Fig 2).

25 4. A device as claimed in any of the preceeding
claims, characterized by a tube or the like
forming a separate drainage channel and adapted to be
introduced to the organ from which tissue is to be removed
e.g. the bladder, said tube or the like completing or
30 replacing the drainage channel in the body.

5. A device as claimed in anyone of the claims 1 - 4,
characterized by the fact that the motor
driving the shaft, said motor being of electrical,
pneumatical or hydraulical nature, is arranged in the
35 interior of or in the near vicinity of the tube-shaped
body or connected to said body by means of a flexible
shaft.

8

6. A device as claimed in any one of the preceding claims, characterized by an electronic safety circuit arranged to stop the motor when bleeding causes a red colouring of the flowing liquid.

5 7. A device as claimed in any one of the preceding claims, characterized by the fact that the knife is replaceably arranged on the shaft.

8. A device as claimed in any one of the preceding claims, characterized by the fact that the
10 knife is transparent when rotated.

9. A device as claimed in claim 8, characterized by the fact that so as to increase the transparency of the knife the rotation speed of the same is chosen such that the movements of the knife blade
15 deviates from the frequency of the light.

20

25

30

35

1/3

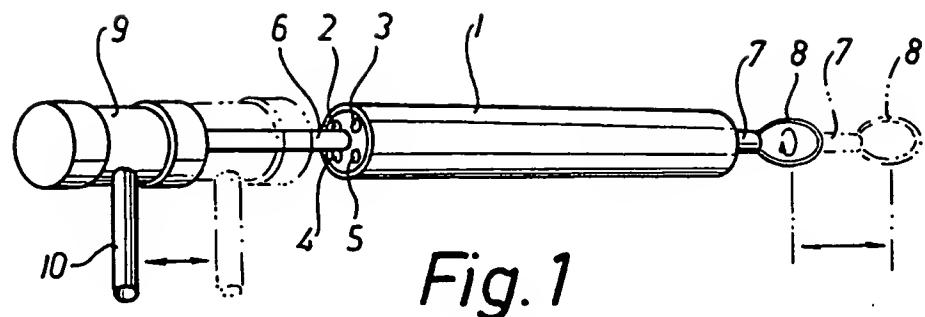


Fig. 1

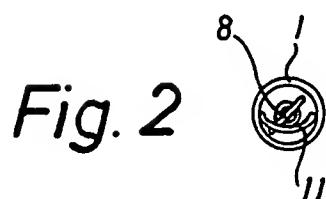


Fig. 2

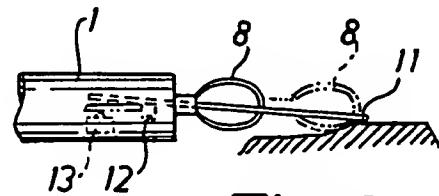


Fig. 3

Fig. 4

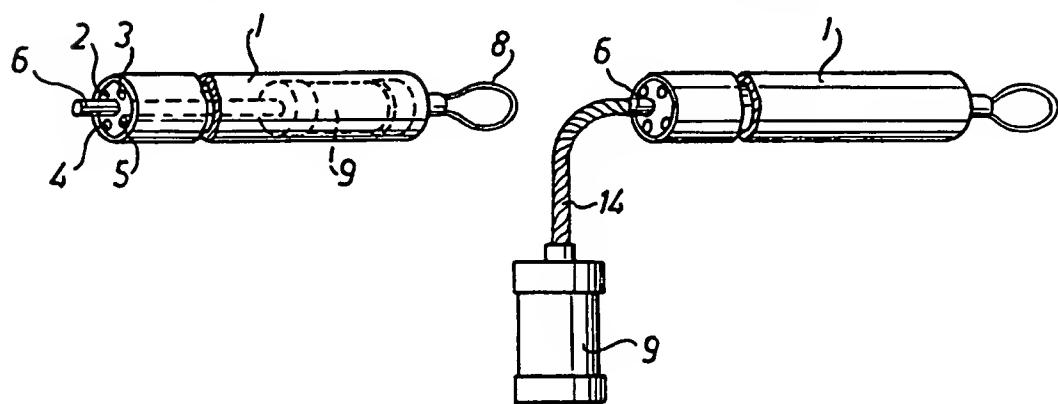


Fig. 5

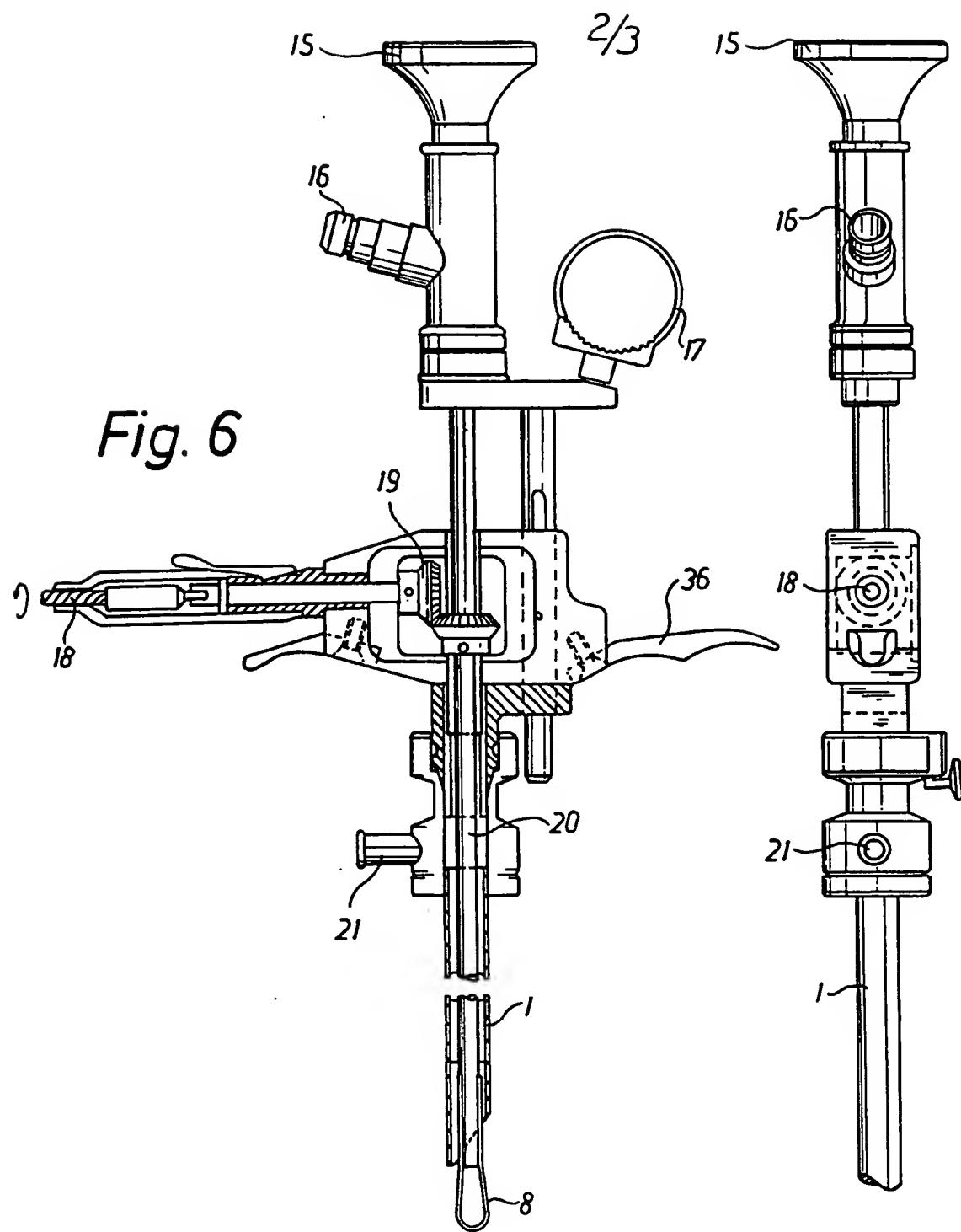


Fig. 7

3/3

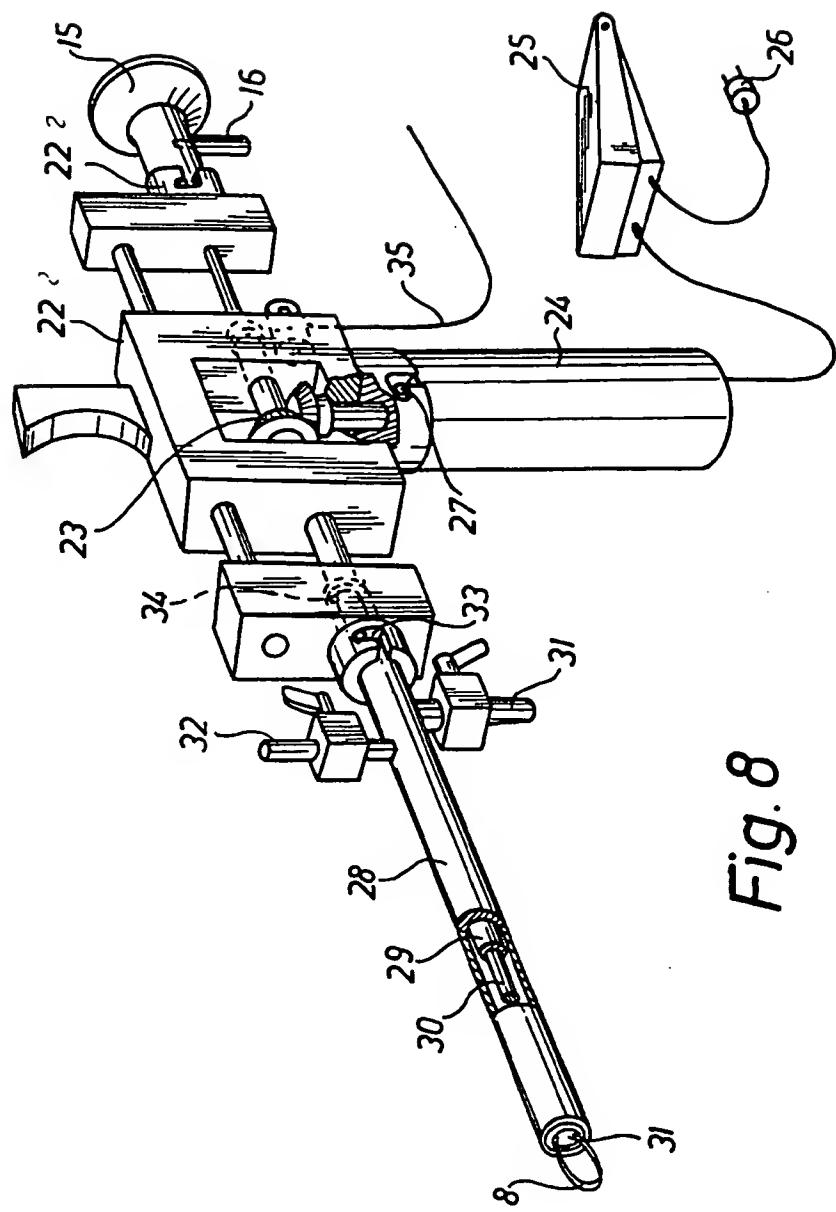


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 94/00413

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61B 17/32, A61B 17/38, A61B 17/39

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, A1, 3339322 (KOLLIAS, G.), 3 May 1984 (03.05.84), figures 1,3, abstract --	1-9
A	US, A, 5133713 (J.-K. HUANG ET AL), 28 July 1992 (28.07.92), figures 1-4, abstract --	1-9
A	US, A, 2448741 (W.W. SCOTT ET AL), 7 Sept 1948 (07.09.48), column 4, line 58 - line 66 --	1
A	US, A, 4423727 (J. WIDRAN ET AL), 3 January 1984 (03.01.84), abstract --	1

 Further documents are listed in the continuation of Box C. See patent family annex.

- * Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "B" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

19 December 1994

Date of mailing of the international search report

22 -12- 1994

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. + 46 8 666 02 86

Authorized officer

Hans Presto
Telephone No. + 46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 94/00413

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,E	SE, A, 9203375 (AB CHRISTER DAHLSTRAND), 13 May 1994 (13.05.94), the whole document -- -----	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

26/11/94

International application No.

PCT/SE 94/00413

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A1- 3339322	03/05/84	NONE		
US-A- 5133713	28/07/92	EP-A-	0448857	02/10/91
US-A- 2448741	07/09/48	NONE		
US-A- 4423727	03/01/84	AU-A- CA-A- EP-A,B- SE-T3- WO-A-	8332082 1177350 0076302 0076302 8203545	04/11/82 06/11/84 13/04/83 28/10/82
SE-A- 9203375	13/05/94	NONE		